C L A I M S

1. A heat processing device that bakes a substrate having a resist coating film containing a volatile substance, the device characterized by comprising:

a hot plate that heats the substrate;

a hot plate temperature control unit that controls a temperature of the hot plate;

a box member having wall surfaces that defines a heat space around the hot plate and defines a fluid space above the heat space, the heat space and the fluid space being communicated to each other and the wall surface that defines the heat space having no opening; and

air current producing means including an air supply port and a suction port opened in the wall surfaces that define the fluid space, that supplies a gas from the air supply port to the fluid space and exhausts the supplied gas from the fluid space via the suction port by suction, to create a current of air flowing in a substantially horizontal direction in the fluid space.

2. The heat processing device according to claim 1, further comprising:

control means for controlling the hot plate temperature control unit and the air current producing means so that a relationship of $TF < TH \leqq TS \leqq TP$ is

satisfied where TP represents a temperature of the hot plate, TS represents an upper surface temperature of the substrate W, TH represents a temperature of the heat space and TF represents a temperature of the fluid space.

3. The heat processing device according to claim 2, further comprising:

a first temperature sensor that detects the temperature TP of the hot plate, a second temperature sensor that detects the upper surface temperature TS of the substrate, a third temperature sensor that detects the temperature TH of the heat space and a fourth temperature sensor that detects the temperature TF of the fluid space.

4. The heat processing device according to claim 1, further comprising:

a filter provided in the box member to partition the heat space and the fluid space from each other, that traps the volatile substance.

5. The heat processing device according to claim 4, further comprising:

filter ascending/descending means controlled by the control means, for changing a distance between the filter and the substrate.

6. The heat processing device according to claim 4, further comprising:

means for detecting a temperature of the filter,

and characterized in that the control means adjusts the distance between the filter and the substrate with reference to the detected temperature of the filter or a change in temperature of the filter.

7. The heat processing device according to claim 3, further comprising:

a cooling unit formed above the fluid space as a part of the box member, that cools down the gas flowing the fluid space.

8. The heat processing device according to claim 7, wherein:

the cooling unit is a water-cooling jacket including a cooling water flow path, a cooling water supply port and a cooling water discharge port.

9. The heat processing device according to claim 7, wherein:

the cooling unit is controlled by the control means and includes a water temperature control unit that controls the temperature of the cooling water equal to the temperature TF of the fluid space.

10. The heat processing device according to claim 7, wherein:

the control means has data regarding a temperature at which the volatile substance precipitates and solidifies, and controls the temperature of the cooling unit with reference to the temperature TH of the heat space detected by the third temperature sensor and the

temperature data.

11. The heat processing device according to claim 10, wherein:

the air current producing means includes a gas temperature control unit that controls the temperature of the gas supplied to the fluid space from the air supply port to be equal to the temperature TF.

12. The heat processing device according to claim 10, wherein:

the suction unit has a single suction port opened in an upper center portion of the fluid space.

13. The heat processing device according to claim 10, wherein:

the suction unit has a plurality of suction ports opened in a circumferential end portion of the fluid space.

14. The heat processing device according to claim 13, further comprising:

a heater provided near each of the suctions ports.

15. The heat processing device according to claim 1, wherein:

the control means controls the air current producing means to make the temperature TF of the fluid space fall within a temperature range between 20℃ or higher and 30℃ or lower, and controls the hot plate temperature control unit to make the temperature TS of the upper surface of the substrate fall within a

temperature range between 23℃ or higher and 80℃ or lower.

16. A heat processing method that bakes a substrate having a resist coating film containing a volatile substance, with use of a heat processing device characterized by comprising: a hot plate; a hot plate temperature control unit; a box member having wall surfaces that defines a heat space around the hot plate and defines a fluid space above the heat space, the heat space and the fluid space being communicated to each other and the wall surface that defines the heat space having no opening; and air current producing means including an air supply port and a suction port opened in the wall surfaces that define the fluid space, the method characterized by controlling the hot plate temperature control unit and the air current producing means so that a relationship of $TF < TH \leqq TS \leqq TP$ is satisfied where TP represents a temperature of the hot plate, TS represents an upper surface temperature of the substrate W, TH represents a temperature of the heat space and TF represents a temperature of the fluid space.

17. The heat processing method according to claim 16, comprising:

controlling the air current producing means to make the temperature TF of the fluid space fall within a temperature range between 20℃ or higher and 30℃ or

lower, and controlling the hot plate temperature control unit to make the temperature TS of the upper surface of the substrate fall within a temperature range between 23℃ or higher and 80℃ or lower.